c. Amendments to Claims

1. (original) An apparatus, comprising:

a 3D array of circuit elements; and

a plurality of control lines for coupling a remote control device to the circuit elements in the 3D array;

wherein each circuit element is configured to transform from one circuit state to another circuit state in response to a change in a control signal received from one of the control lines; and

wherein a 3D region of the 3D array behaves as a metamaterial at a frequency when the circuit elements of the 3D region are in one set of circuit states and behaves as a normal refractive medium at the same frequency when the circuit elements of the 3D region are in another set of circuit states.

2. (original) The apparatus of claim 1, wherein the circuit elements comprise split ring resonators and wire strips; and

wherein a portion of the circuit elements of the array comprises switches or varactor diodes connecting conductive portions of the same circuit elements.

3. (currently amended) The apparatus of claim 1, wherein a portion of the individual circuit elements comprise switches or varactor diodes, the switches or varactor diodes being able to transform ~~an~~ associated ones of the circuit elements between associated ones of the circuit states.

4. (original) The apparatus of claim 3, wherein the switches or varactor diodes are responsive to the control signals received from associated ones of the control lines.

5. (original) The apparatus of claim 1, further comprising:

the control device, the control device being connected to the control lines and being configured to produce the control signals on the control lines.

6. (original) The apparatus of claim 5, wherein the 3D region is smaller than the entire 3D array.

7. (original) A system for wireless transmission or wireless reception, comprising:

one of a wireless transmitter and a wireless receiver, the one of a transmitter and a receiver having a wireless communication frequency; and

a refractive medium located to intercept beams of the electromagnetic radiation one of transmitted from the transmitter and received by the receiver; and

wherein the refractive medium includes a 3D region capable of transforming between first and second states, the 3D region being a metamaterial at the wireless communication frequency when in the first state and being a normal refractive medium at the wireless communication frequency when in the second state; and

wherein the refractive medium is configured to steer one of the intercepted beams between a first direction and the one of a wireless transmitter and a wireless receiver when the 3D region is in the first state and is configured to steer one of the intercepted beams between a different second direction and the one of a transmitter and a receiver when the 3D region is in the second state.

8. (original) The system of claim 7, further comprising a tower that supports the one of a transmitter and a receiver and refractive medium at a vertical distance above ground level.

9. (original) The system of claim 7, further comprising:

a control device;

a plurality of lines coupling the control device to the refractive medium;

wherein the control device is configured to transmit optical or electrical control signals to the lines to transform the 3D region between the first and second states.

10. (original) The system of claim 9, wherein the medium comprises a 3D array of switches or varactor diodes responsive to the control signals on the control lines.

11. (original) The system of claim 10, wherein the medium includes a regular 3D array of substantially identical circuit elements, the switches or varactor diodes being able to transform circuit states of the identical circuit elements.

12. (original) The system of claim 7, wherein the 3D region has a smaller volume than the 3D medium.

13. (original) The system of claim 7, wherein the first direction and the second direction are directions of the intercepted beams from the medium.

14. (original) A method for wireless transmission or wireless reception, comprising:

selecting a first transmission or reception direction for a wireless communication;

transmitting optical or electrical control signals to transform a region of a 3D medium from being in a normal refractive state at a selected frequency to being in a metamaterial state at the frequency; and

then, steering a beam of electromagnetic radiation between the selected first direction and one of a wireless transmitter and a wireless receiver, the radiation having the selected frequency, the steering including refracting the beam at an interface between the region and a normal refractive medium.

15. (original) The method of claim 14, further comprising:

selecting a second direction for wireless transmission or reception, the second and first directions being different;

changing the control signals being transmitted to re-transform the region back to being in the normal refractive state at the selected frequency; and

then, steering a second beam of electromagnetic radiation beam between the selected second direction and the one of a wireless transmitter and a wireless receiver, the second beam of electromagnetic radiation having the selected frequency, the steering a second beam including passing the second beam through the 3D medium.

16. (original) The method of claim15, wherein the 3D medium comprises a regular 3D array of circuit elements and the step of transmitting a control signal changes states of switches or varactor diodes located in the region.

17. (original) The method of claim 16, wherein the region of the 3D refractive medium is wedge-shaped.